Memorandum

U.S. Department of Transportation
Federal Aviation Administration

Subject:	INFORMATION: Transport Airplane Directorate Policy Regarding Methods Used to Determine the Likelihood of Catastrophic Failure Events	Date:	November 18, 1999
From:	Manager, Transport Standards Staff, ANM-110	Reply to Attn. of:	ANM-115-99-22
To:	Manager, Seattle Aircraft Certification Office, ANM-100S		

This is in response to your memorandum 99-130S-0860, dated November 4, 1999. The referenced memorandum requests a clarification of the Transport Airplane Directorate (TAD) policy regarding the use of numerical probability analysis methods in demonstrating that an event is extremely improbable. We understand that the current issue arises out of a recent compliance discussion regarding § 25.783. This memorandum will primarily focus on that section of the regulations.

It is important to distinguish between the policy associated with this issue and what is essential (or allowed) for compliance. The policy in regard to the type of safety analyses that is required is clearly stated in Advisory Circular 25.783-1. Either a qualitative or a quantitative analysis, or a combination of the two, may be used to show that inadvertent opening of a door is extremely improbable. The choice and the degree to which either of these is used is a compliance question, not a policy question. The bottom line is that the certification office must be able to make an engineering judgement relative to the extremely improbable nature of the failure condition. If this can be done with a qualitative analysis alone, such as a failure modes and effects analysis, then the “policy” allows that means of compliance.

For many door installations, the operating systems are complex electrical or hydraulic systems, or even computer controlled. For such systems, it may be very difficult to make any kind of judgement without the aid of a numerical estimate of the probability. If the manufacturer is unable to demonstrate compliance with a qualitative analysis to the satisfaction of the certification office, then the manufacturer is obligated to select a method that will demonstrate compliance to the satisfaction of the office.

The TAD does not discourage the use of numerical analysis as an aid in deciding if an event is extremely improbable. The message the TAD intended to give at the Cargo Conversion Workshop was that these analyses are useful and needed in many cases. The TAD has discouraged the use of numerical probability analysis as the sole method in making a pass/fail compliance determination at a fixed numerical level, rather than to use such an analysis as an aid in making a finding. This is particularly important for mechanical systems such as doors and flight controls where reliable failure data are hard to obtain, where dependencies are subtle and frequently overlooked, and where human error and abuse play a large role in the overall safety outcome.

In addition to the above, the TAD has recently processed an appeal from the

Raytheon Aircraft Company regarding § 25.671(c)(2). The position noted in the letter to Raytheon (see attachment), fully coordinated with Regional Counsel, should be of interest to your staff members involved in making findings of compliance to that requirement.

Dorenda D. Baker

Attachment